WHY ACCURATE RUNWAY SURFACE FRICTION MEASUREMENT SHOULD MATTER TO Airports

How this information can help set your airport apart

HALLIDAY TECHNOLOGIES

IIRT3®

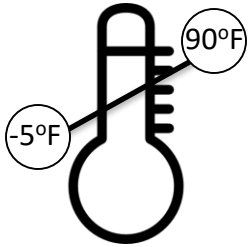
FRICTION UNRAVELED

// WHY FRICITON TESTING STILL MATTERS FOR WINTER MAINTENANCE

UNDERSTANDING FRICTION

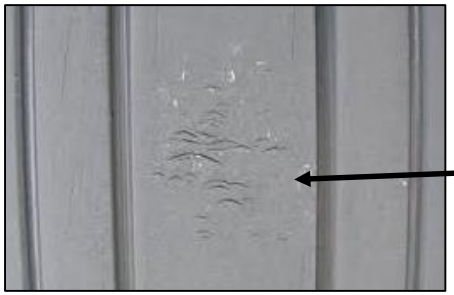
HERITAGE IN RACING

FRICTION & THE TIRE



Temperature of the compound

Pressure affecting contact patch size and driver feel



Degradation of the compound

FRICTION & TRACK SURFACE

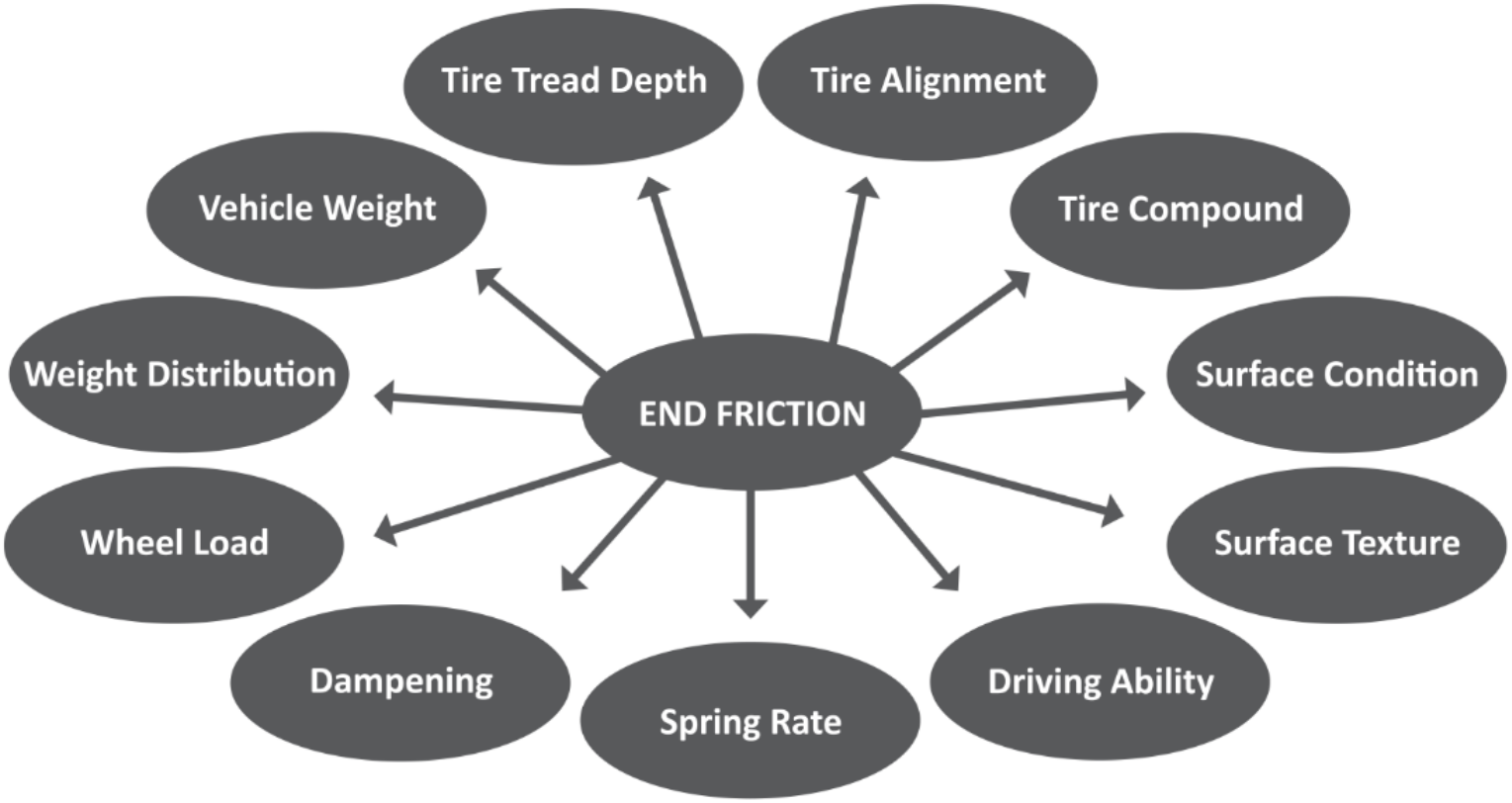
- Concrete, asphalt and surface transition
- Aggregate surface area in contact with tire (macro texture)
- Surface friction changing with addition of rubber and contaminant
- Surface elevation change

FRICTION & RUNWAYS

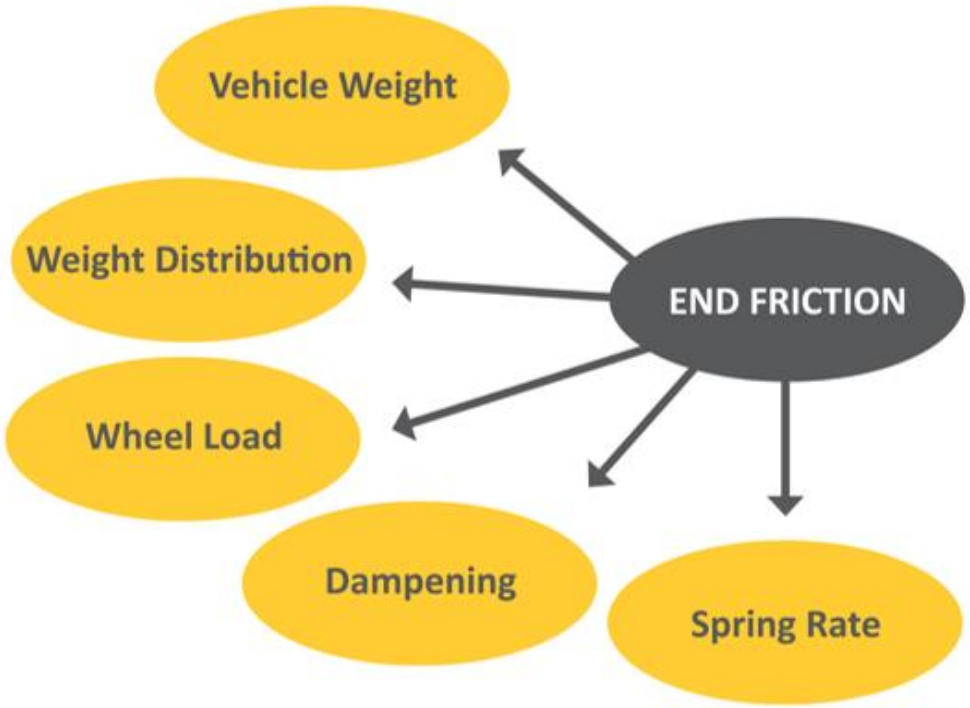
What we have learned in racing applies to airport runway safety.

Testing equipment ***must*** be designed to **eliminate as many variables that effect friction as possible.**

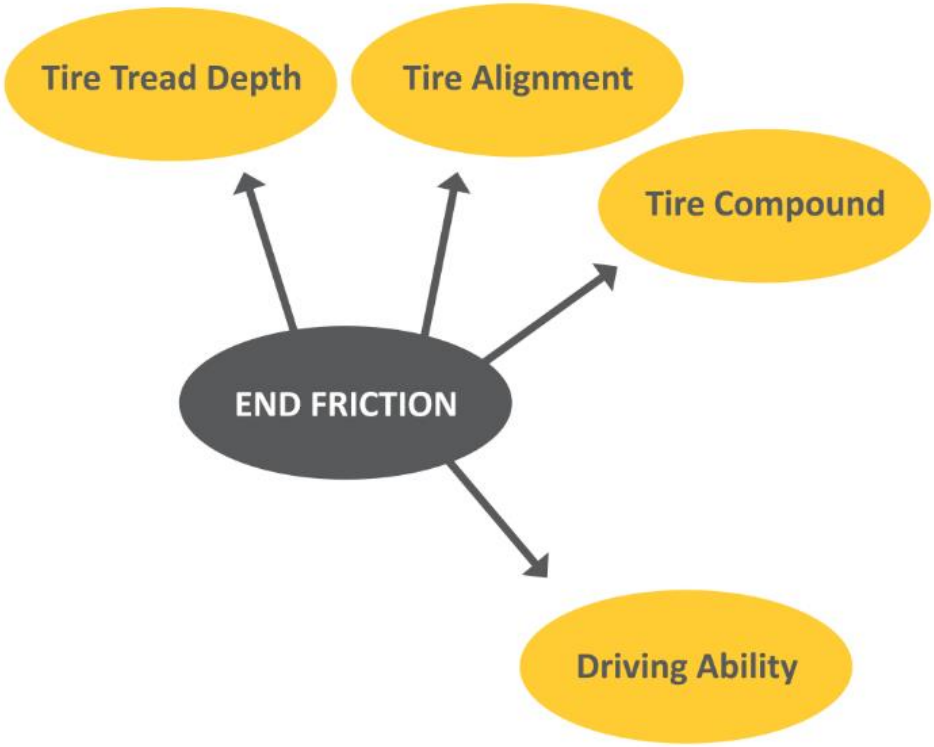
FACTORS AT PLAY



WE ELIMINATE THE VEHICLE FACTORS

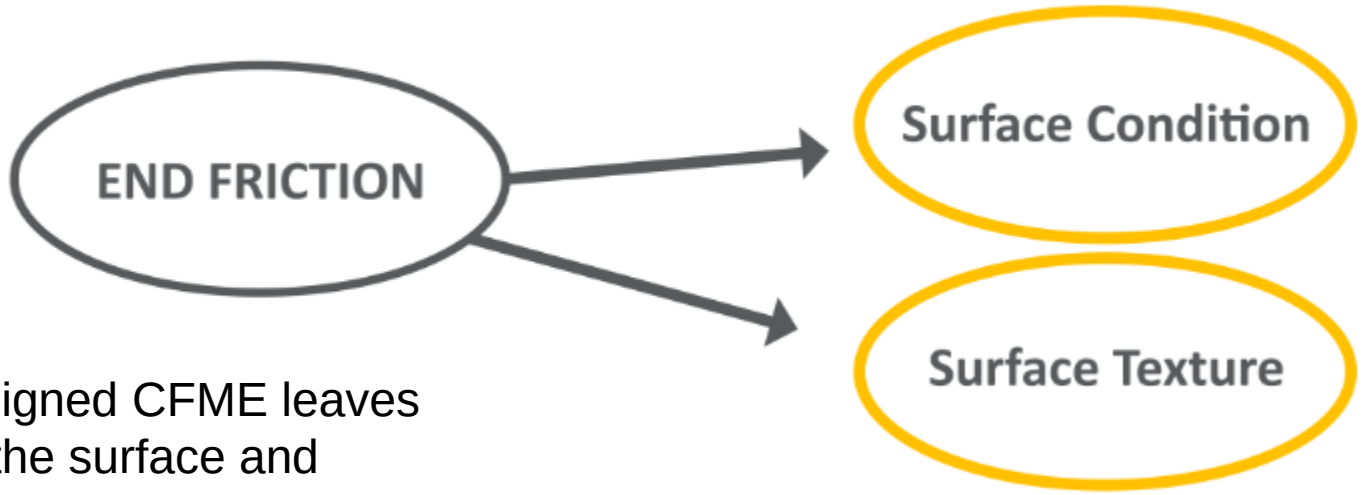


THEN WE ELIMINATE THE DRIVER & TIRE FACTORS



WE ARE LEFT WITH THE FOLLOWING

THAT THE RT3 CAN MEASURE



A well designed CFME leaves only the surface and environmental conditions affecting friction.

RT3 FLIGHT TO DECELEROMETER

	RT3 FLIGHT	DECELEROMETER
Operator dependent	**No**	**Yes**
Affected by driver performance	No	Yes
Results can be manipulated	No	Yes
Accurate, repeatable reliable results	**Yes**	**No**
Speed of test limited	**15-60 mph: operate a safe speed for the conditions when testing dry without water system**	**Yes**
Changes to the vehicle affect the results	**No**	**Yes**
Change to CG	No	Yes
Change in fuel level	No	Yes
Change in brake condition	No	Yes
Change in tire condition	No	Yes
Change in number of occupants	No	Yes
Change in weight of cargo	No	Yes

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RT3 FLIGHT TO DECELEROMETER

	RT3 FLIGHT	DECELEROMETER
Number of readings	**100 readings per second averaged to one second data output**	**Typically 9 spots tested on the runway**
Additional wear and tear on the vehicle	**None**	**Can be significant up to $4k per year when parts and labored are factored in with the vehicle requiring replacement in 3-4 years. Further changes in design impact ability to use decelerometers.**
Hard on Operators	**No**	**Yes**
Causes headaches and nasea	No	Yes
Can not be driven by pregnant women	No	Yes
Can not be driven by individuals with back problems	No	Yes
Year round use	**Yes**	**No**
Customizable software	**Yes**	**No**

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FRICTION UNRAVELED

// RUNWAY MAINTENANCE

FRICTION MEASUREMENT

QUESTIONS BEING ASKED IN THE SUMMER

- What should my maintenance planning schedule be?
- Is rubber removal necessary?
- Is water draining?
- How has any surface restorative process worked?

FRICTION MEASURMENT

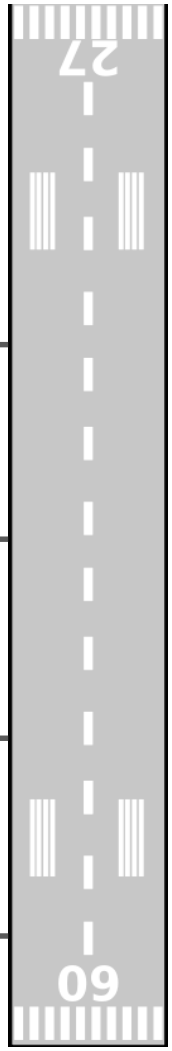
THE RT3 CAN ANSWER YOUR QUESTIONS ASKED IN THE SUMMER

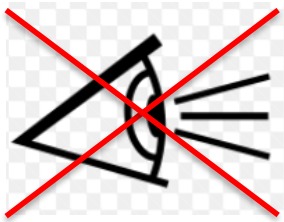
1. _____
Measures changes to the surface

2. _____
Identifies rubber contaminant on the surface

3. _____
Shows how the surface is displacing water

4. _____
Aids in budgeting prioritization planning





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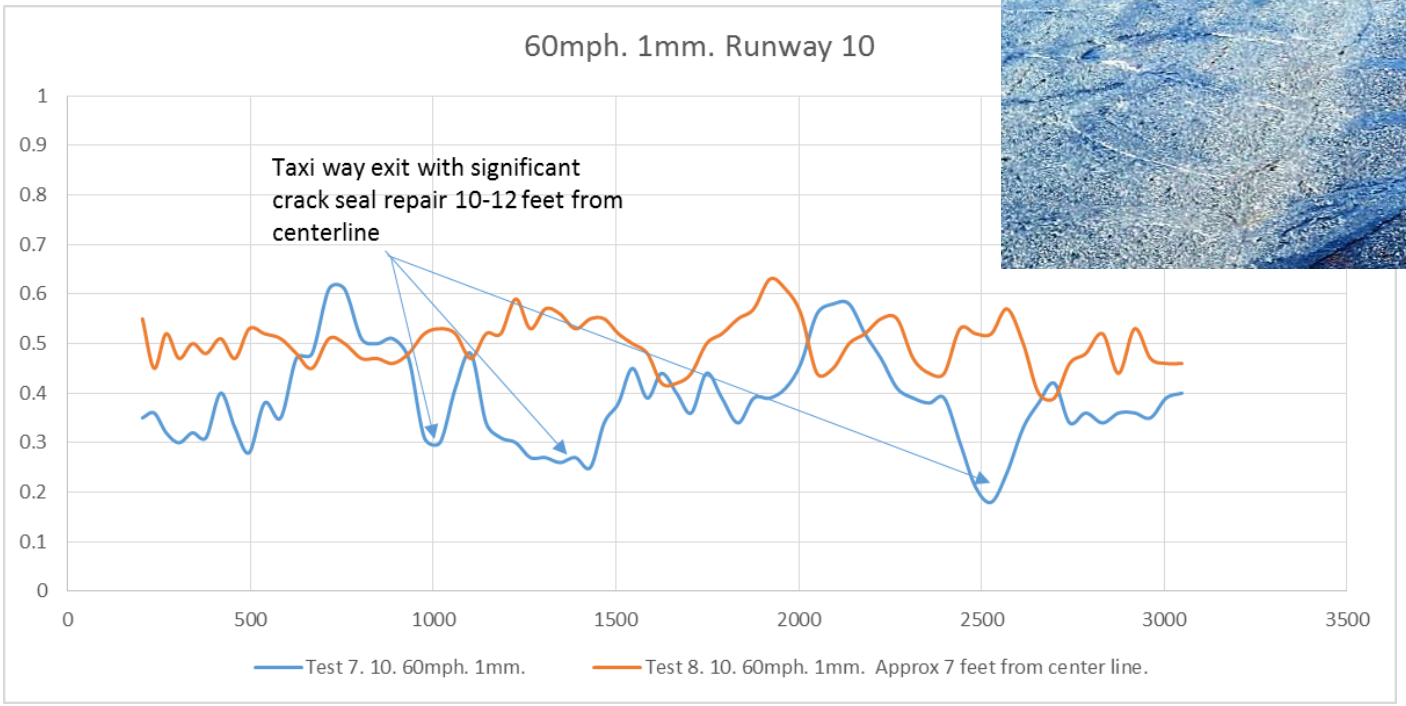
GREAT LAKES REGION AIRPORTS

- WI, ND, SD, MI, MN, ILL
- OH, IND

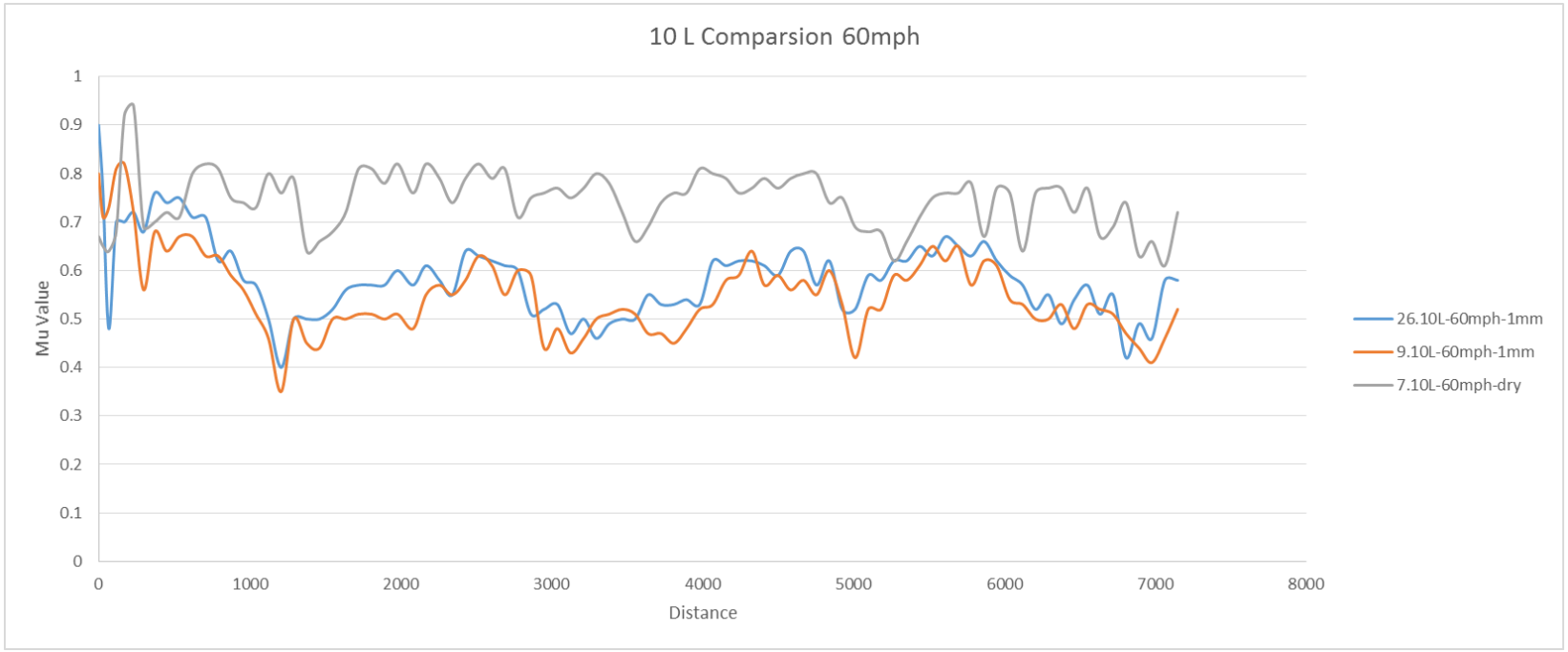
NUMBER OF DAILY MINIMUM TURBOJET AIRCRAFT LANDINGS PER RUNWAY END	MINIMUM FRICTION SURVEY FREQUENCY
Less than 15	1 YEAR
16-30	6 MONTHS
31-90	3 MONTHS
91-150	1 MONTH
151-210	2 WEEKS
Greater than 210	1 WEEK

WORN RUNWAY EXAMPLE

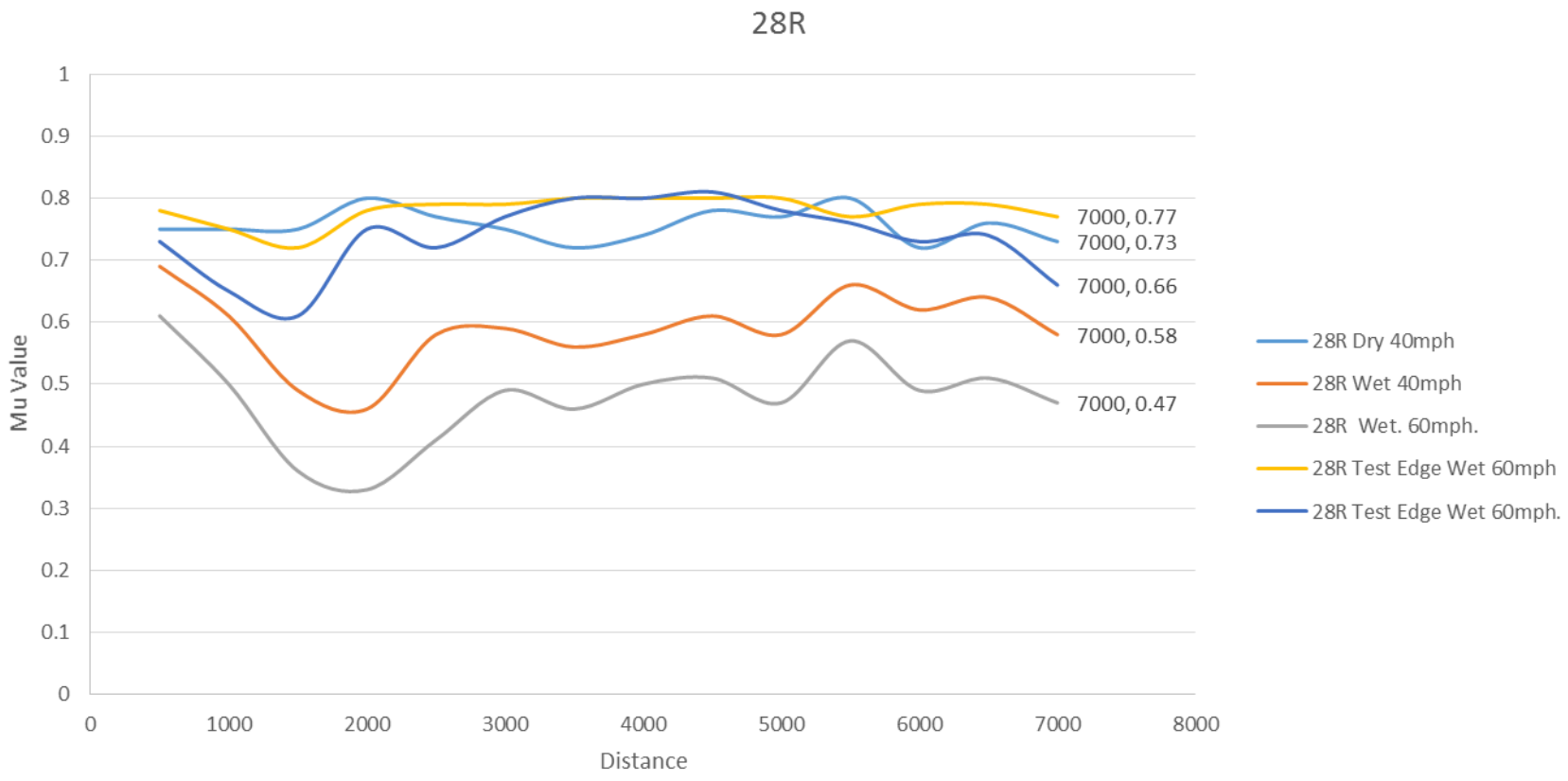
Crack sealing changed micro, macro and mega texture of the surface!



WORN RUNWAY EXAMPLE



RUNWAY EDGE EXAMPLE



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FRICTION UNRAVELED

// WINTER MAINTENANCE

FRICTION MEASUREMENT

QUESTIONS BEING ASKED IN THE WINTER

- Can I land planes?
- Is there black ice?
- Has treatment worked?
- Has surface restored?
- Is my surface slippery when wet?

FRICTION MEASURMENT

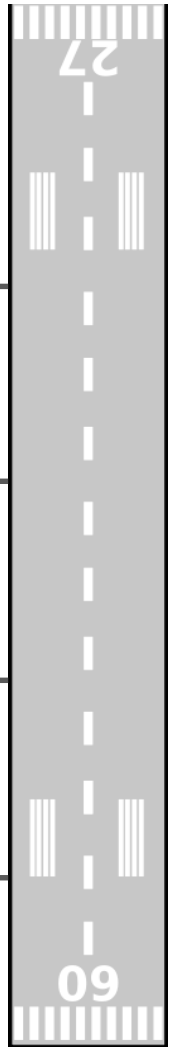
THE RT3 CAN ANSWER YOUR QUESTIONS ASKED IN THE WINTER

1. _____
Provides an objective value

2. _____
Identifies patches of black ice

3. _____
Tests chemical/treatment effectiveness

4. _____
Identifies when the surface is restored to an acceptable level of friction.



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RCAM IS FINALLY HERE!

RUNWAY CONDITION ASSESSMENT MATRIX

- We no longer report Mu Values to pilots
  - Number system based on visual inspection of the runway
  - Friction testing values from an approved friction device
    - Downgrade or upgrade your surface
  - Experience

SO WHY DO YOU NEED A CFME DEVICE?

WHAT HAS REALLY CHANGED?

RCAM CHANGES EXPLAINED

YOU STILL HAVE TO KNOW:

1. Is it safe to land a plane?
2. Have the chemicals we have put down done the job?
   i. Do I need more chemicals or to stop?
   ii. If I add more chemical/sand will it decrease friction?
3. How to validate pilot feedback on braking action?
4. Is my surface slippery when wet?
   i. 1.12.20 of AC 150/5200-30D

TOOLS WE USE

SUBJECTIVE - EXPERIENCE DRIVEN

- Visual inspection of the surface and conditions
- The trusted foot test
- Vehicle handling on the surface
- Reports back from pilots
- Experience

SOMETIMES INACCURATE

- Decelerometers
- Competitors equipment

CUSTOMER WISH LIST

CUSTOMER CFME REQUIREMENTS

- Friction result to be representative of surface conditions
- Reliable & repeatable result
  - Not operator performance dependent
  - Changes to the vehicle do not affect the result
- Runs with minimal maintenance
- Does not put additional wear and tear on host vehicle
- Easy to use

CUSTOMER WISH LIST

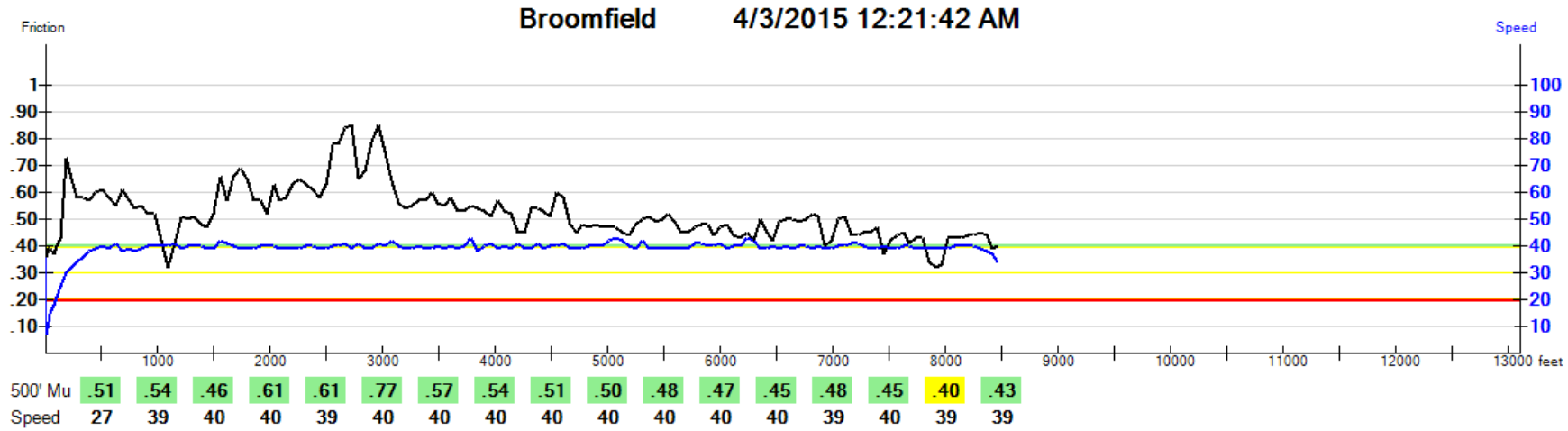
CUSTOMER CFME REQUIREMENTS

- Friction result easily interpreted
  - Software is customizable
  - Interface to existing reporting systems is possible
  - GPS positioning
- Operate in severe conditions
- To measure friction without water
- Have a system that attaches to the vehicle but can be removed

NOT ALL DEVICES ARE EQUAL

A well designed CFME device adds to the tools that we use everyday by providing an objective measurement that is repeatable, reliable and **OPERATOR INDEPENDENT.**

DATA OUTPUT - WINTER



Rubber removal: False
Name: 12L
Distance: 8000
Surface type: Grooved Asphalt

Speed: 40
Conditions: Slush
Surface temp: 31
Dew point:
Air temp: 29
Dist from center line: 10

Depth of Contaminant: 1/8
Last treatment:
Cleared by:
Measurement trigger:
Last Time Cleared:
Treatment Time:

Other: 40

End text:
Average until stop: .52

3/3 total average friction .52

1/3 average friction	**.56**
2/3 average friction	**.55**
3/3 average friction	**.45**

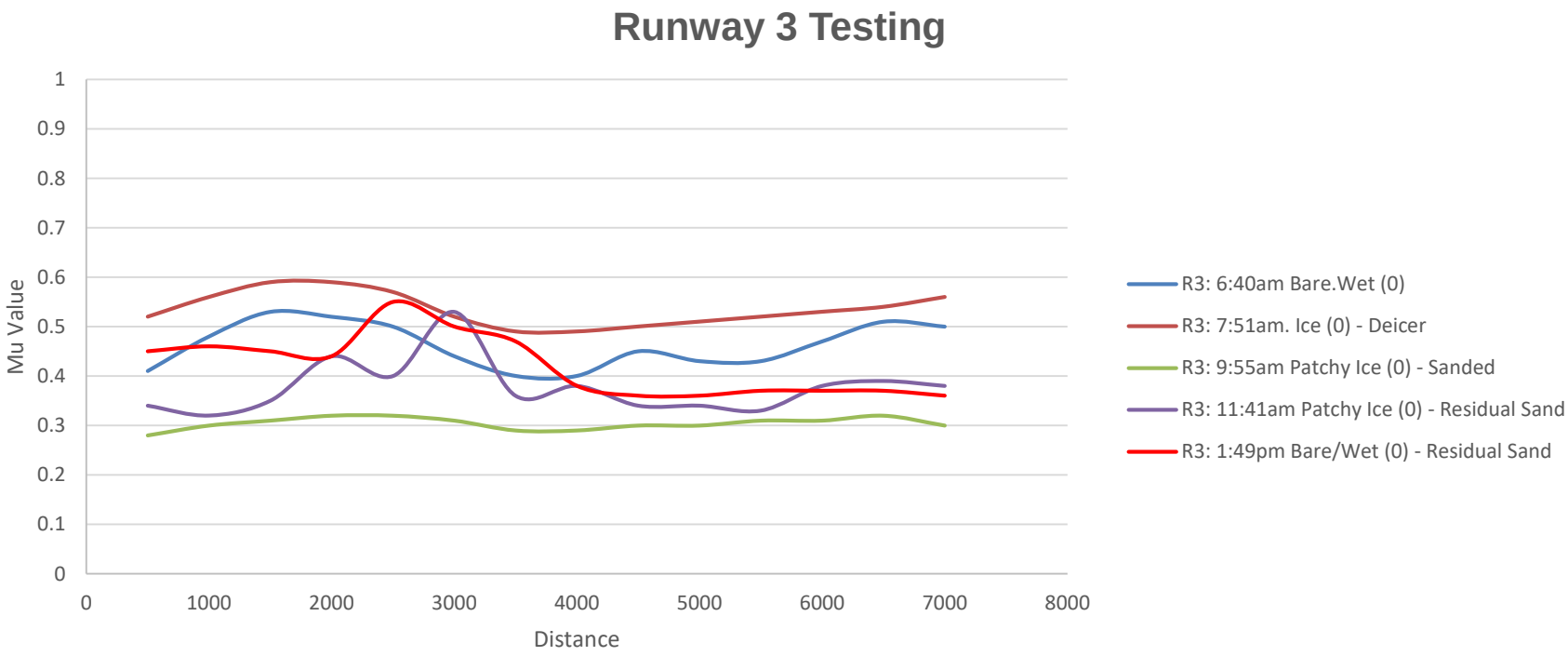
Surface conditions:

Good	>=0.4
Deteriorating. Monitor	.30-.39
Deteriorated. Monitor closely/treat	.21-.29
Very slippery. Take caution	<=0.2

HTI MU Value to surface condition table (Showing approximate Mu Values to Surface conditions) Please note that all FAA published material state there is not direct correlation between Mu Values and aircraft braking action.

COMPARATIVE DATA - WINTER

CONDITION CHANGES WITH TREATMENT



QUESTIONS

HALLIDAY TECHNOLOGIES INC.

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